Based on the data provided by Udacity through its Data Analyst Nanodegree Program, this report will summarize and illustrate charts as well as report on insights of Titanic data, which contains demographics and passenger information from 891 out of 2224 passengers and crew on board.

Throughout the analysis, a number of main measures will be used frequently to answer the main questions. Examples of which include the number of passengers on board based on their passenger class: Pclass 1 for Upper Class, Pclass 2 for Middle Class, and Pclass 3 for Lower Class.

The main thesis in this report will be based on passenger class and the variables that curculate around it. It will be answereing question of: where did most of the passengers stayed during their time on the titanic, and how do other variables, such as sex (male or female), age, and fare that led to survival(Survived = 1) or death (Survived = 0).

Specific Questions for this Dataset: • How many passengers boarded the titanic based on Pclass? • How many males and females were on the titanic based on Pclass? • How many passengers survived based on Pclass? • Based on those who survived and those who didn't, were they male or female ? • What is the survival rate of passengers based on sex and Pclass? • Which age group had the most passengers on the titanic? • For passengers who lived, what age group stood out? • What was the average age of passengers who survived based on Pclass and sex? • For passengers who died, what age group stood out? • What was the average age of passengers who died based on Pclass and sex? • Who didn't pay any fare on the titanic? • What was the average fare for each Pclass? • Who paid the highest fare? • Who paid the lowest fare?

Comprehensively, on the Titanic, there are a total of 2224 passengers, but we will be analyzing only 891 (roughly 40 percent of all data.) At the end of the report there will be a summary, conclusions about passengers on the titanic based on the data given.

1. Introduction to the Titanic Dataset

In [76]:

```
# Importing libraries pertaining to this project:
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
```

```
In [77]: #Reading CSV File into Pandas DataFrame
         titanic_set = pd.read_csv('Titanic Dataset.csv')
         titanic_set.head()
```

Out[77]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

2. Cleaning Data (Removing uneeded variables)

Removing some data

After looking at the printout of the DataFrame containing the available information about the passengers, I decided to remove three of the columns. The new dataset will be called titanic_newset Those were:

Ticket Embarked Cabin

In [78]:

```
titanic_newset = titanic_set.drop(['Ticket','Cabin', 'Embarked',], 1)
titanic_newset.head()
```

Out[78]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Fare
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	7.2500
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	71.2833
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	7.9250
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	53.1000
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	8.0500

Any Missing Values ?

There is a good number of null values for the column age. 177 is a considerable amount of null data and must be taken in consideration for further analysis.

In [79]:

```
titanic_newset.isnull().sum()
```

Out[79]:

```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Fare             0
dtype: int64
```

Descriptive Labeling

Variables 'Pclass' and 'Survived' have been more clearly defined for better understanding.

```
In [80]: #Create Survival Label Column
         titanic_newset['Survival'] = titanic_newset.Survived.map({0 : 'Died', 1 : 'Survived'})
         titanic_newset.Survival.head()
```

```
Out[80]: 0        Died
         1    Survived
         2    Survived
         3    Survived
         4        Died
         Name: Survival, dtype: object
```

```
In [81]: # Create Pclass Label Column
         titanic_newset['Class'] = titanic_newset.Pclass.map({1 : 'First Class', 2 : 'Second Class', 3 : 'Third Cl
         titanic_newset.Class.head()
```

```
Out[81]: 0    Third Class
         1    First Class
         2    Third Class
         3    First Class
         4    Third Class
         Name: Class, dtype: object
```

Total Passengers based on Pclass

Based on the 891 passengers recorded in the dataset, it is safe to say that the majority of passengers on the Titanic were in the third class with a total of 491. First Class came in second with 216 passengers. Second Class came in third with the least amount of passengers with 184. This is a good start. We now know that over 50% of the passengers on board were stored in the lower deck of the ship. This could impmly that the majority of passengers in third class had a difficult time fighting for survival than others in their respected passenger class. More analysis must me done.

In [106]:

```
# Count how many passengers were within each Pclass
passenger_pclass = titanic_newset.groupby(['Class']).count()['PassengerId']
print(passenger_pclass)
```

```
Class
First Class     216
Second Class    184
Third Class     491
Name: PassengerId, dtype: int64
```

Survival based on Pclass

In the first set, we discovered that the majority of passengers on the Titanic were located in Pclass 3. According to the data below,it is shown that passengers in third class suffered greatly as most of them died, not only within their own passenger class but out of all passenger classes in the dataset. What's interesting is that the majority of passengers in first class were able to survive after being on the titanic. A little over 50% of passengers in second class died during the sinking of the titanic, while the others within that class survived.

In [107]:

```
pclass_survival = titanic_newset.groupby(['Class','Survival'])['PassengerId'].count().unstack()
print(pclass_survival)
```

```
Survival      Died  Survived
Class
First Class     80       136
Second Class    97        87
Third Class    372       119
```

Sex based on Pclass

According to the datset, males ruled the titanic in terms of population as they outnumber females in every passenger class.The males in third class outnumber all the other males in the first two classes by a longshot with 347 passengers. Another interesting note is the amount of females that were in the third passenger class. The females in that class outnumber the females in the first two classes with 144 passengers.

In [108]:

```
#Create a histogram that shows the ages of people on the titanic.
survivor_sex = titanic_newset.groupby(['Class','Sex'])['PassengerId'].count().unstack()
print(survivor_sex)
```

```
Sex           female  male
Class
First Class       94   122
Second Class      76   108
Third Class      144   347
```

Pclass and Survival based on Sex

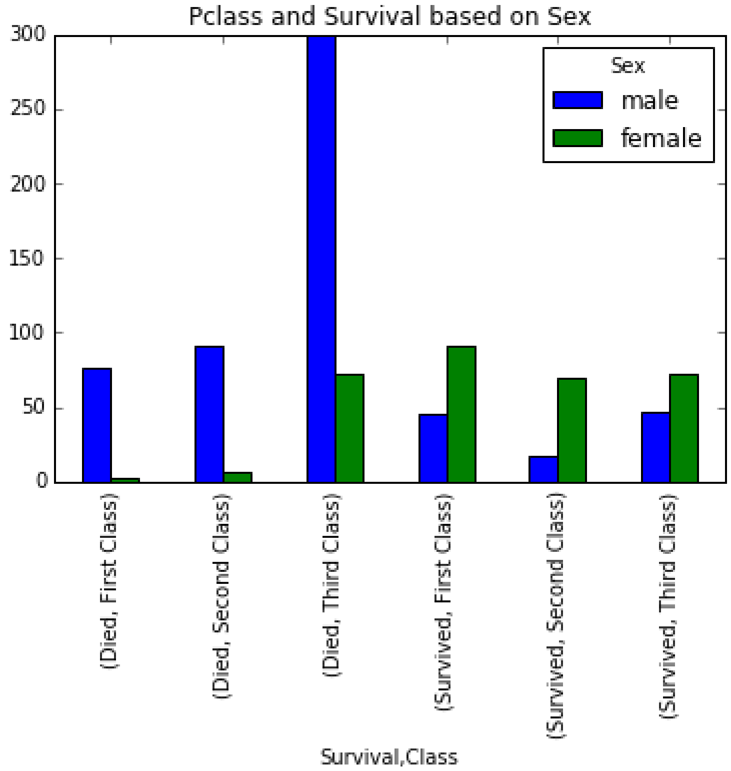
This bar chart analyzes the passenger class and the survival data based on whether they were male (blue) or female (green). This plot is prettt interesting. It shows for the most part women that were a priority for safety and survival, particularly within first and second class. For females in third class, according to the chart, it seems that roughly half of them survied while the other half died during the sinking of the Titanic. Many males, especially males in third class, perished while on the sinking ship when compared to the males that survived. What was interesting is the amount of males that actually survived. One thing for sure is that women and children (male or female) were priority for saftey be for adult males (atleast in the movies).

```
In [85]:
survivor_sex_pclass = titanic_newset.groupby(['Sex','Survival','Class'])['PassengerId'].count().unstack('

% pylab inline
survivor_sex_pclass[['male','female']].plot(kind='bar', stacked=False)
plt.title("Pclass and Survival based on Sex")
```

```
Populating the interactive namespace from numpy and matplotlib
```

```
Out[85]: <matplotlib.text.Text at 0x114df9358>
```



This set basically shows the average percentage of survival for both sexes based on passenger class. It shows that females in first and second class had a very high rate of survival, which means they were mostly likely to live during the sinking of titanic. Females in third class, like stated earlier, had a 50% chance of surival while on the titanic. This set alone shows that women were indeed a priority for ensuring saftey during the sinking of the titanic, but the data for men shows a differnt story. Males had less than a 50% survival rate for every pclass. Even though males had a low survival rate all across the board, men in first class had a higher surival percentage of 36.9%. Males in second and third class had percentages of 15.7% and 13.5% respectively. If you were a male on the titanic in second and third class, your chances of survival were very slim.

In [109]:

```
survival_by_sex_pclass = titanic_newset.groupby(['Sex', 'Class']).mean()['Survived']
survival_by_sex_pclass
```

Out[109]:

```
Sex     Class
female  First Class     0.968085
        Second Class    0.921053
        Third Class     0.500000
male    First Class     0.368852
        Second Class    0.157407
        Third Class     0.135447
Name: Survived, dtype: float64
```

That being said, even though it shows that women were a priority for survival, age could also play a factor (children on the ship) in the survival and non survival of passengers on the Titanic. Some questions we would like to ask consit of: What is the breakdown of age based on the passengers on the ship, what were the ages for the passangers who lived and the passengers who died, what were the ages for the passengers who lived that were male and the passengers who were female. More analysis must be done.

Age

Before we begin, it should be noted that based on 891 passengers, 177 of them have null data for age. The data below is the statistical values for the variable 'Age'. The dataset accounts for 891 passengers on the titanic but only has 'Age' accounted for 714 of the passengers. The average age of all passengers reported in the titanic datset is roughly 30 (29.6). The standard deviation of 'Age' in this dataset is 14.53, which tells me that the data for the variable is spread out. The youngest person on the ship is .42 years old, a baby, while the oldest person is 80 years old.

```
In [87]: titanic_set[['Age']].describe()
```

Out[87]:

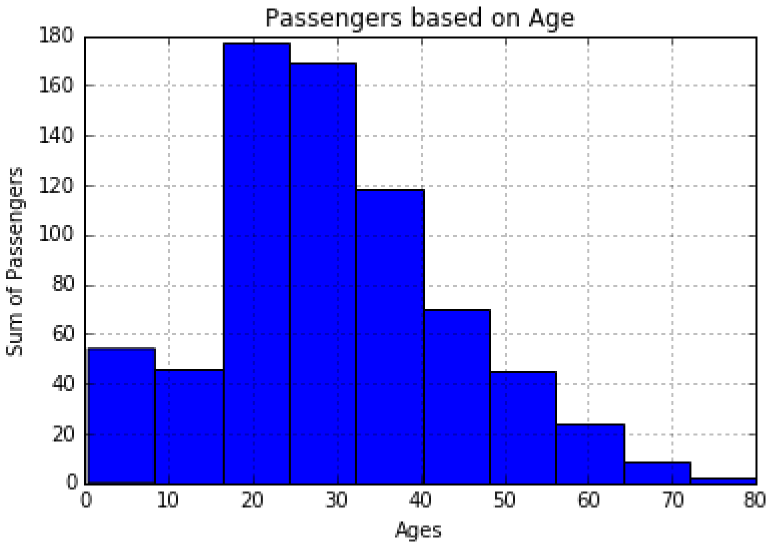
	Age
count	714.000000
mean	29.699118
std	14.526497
min	0.420000
25%	20.125000
50%	28.000000
75%	38.000000
max	80.000000

Age Histogram

This histogram shows that the majority of passengers on the Titanic are in their 20s while passenegers in their 30s and 40s come in second and third respectively. It is safe to say that the majority of passengers were in between 20 and 40 years old. According to the histogram there were quite a number of kids on board the Titanic.

```
In [88]: titanic_newset['Age'].hist()
         plt.title('Passengers based on Age')
         plt.xlabel('Ages')
         plt.ylabel('Sum of Passengers')
```

```
Out[88]: <matplotlib.text.Text at 0x114ddecf8>
```



To get a better understanding about age based on who survived and who didn't , I decided to create two new variables by splitting the column Survived. The first variable represents the pasengers who didn't survive while the other variable represents those who did.

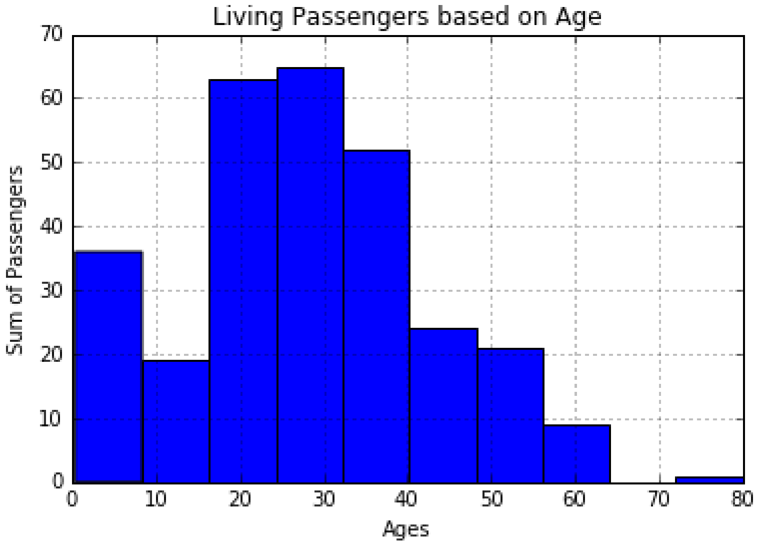
```
In [89]: #Represents the passengers who died
         titanic_deceased = titanic_newset[titanic_newset["Survival"] == "Died"]
         #Represents the passengers who survived
         titanic_living = titanic_newset[titanic_newset["Survival"] == "Survived"]
```

Living Passengers Based on Age

A expected, there were plenty of survivors who were in their 20s and 30s since the majority of passengers. It was interesting to see how manny children(ages 0-10) were on the titanic, ranging around 35 kids saved based on the data.

```
In [90]: titanic_living.hist('Age')
         plt.title('Living Passengers based on Age')
         plt.xlabel('Ages')
         plt.ylabel('Sum of Passengers')
```

```
Out[90]: <matplotlib.text.Text at 0x118acfac8>
```



Average Ages for Living Passengers

Living males in first class top the entire list as being the oldest with an average age of 36.24. Males in this class are also the oldest males out of all passenger classes. The average age for living females in first class also top the list with an average age of 34.93, higher than the averages ages in the other classes. Living males in Second class had the youngest group out of all classes and sex with an average age of 16.02. The lowest average age for females comes from thrid class with an average age of 19.33.

```
In [91]: titanic_living.groupby(['Class','Sex'])['Age'].mean()
```

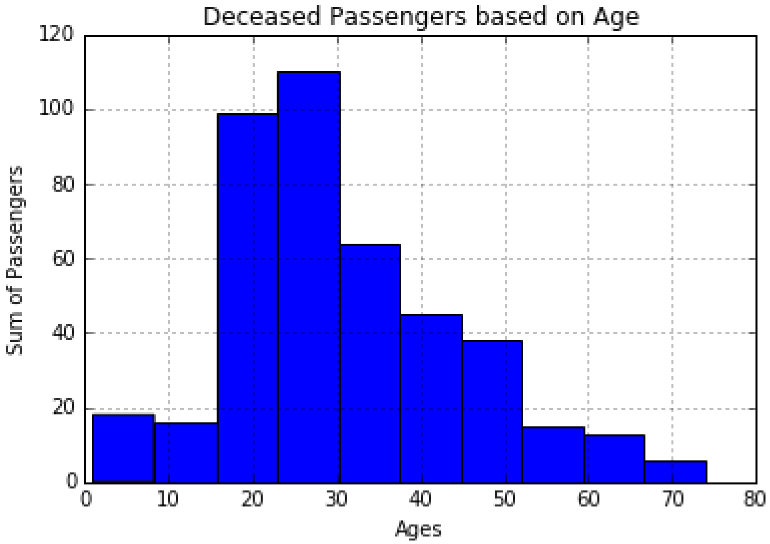
```
Out[91]: Class         Sex
         First Class   female    34.939024
                       male      36.248000
         Second Class  female    28.080882
                       male      16.022000
         Third Class   female    19.329787
                       male      22.274211
         Name: Age, dtype: float64
```

Deceased Passengers based on Age

A expected, there were plenty of deceased passengers who were in their 20s and 30s since the majority of passengers.

```
In [92]: titanic_deceased.hist('Age')
         plt.title('Deceased Passengers based on Age')
         plt.xlabel('Ages')
         plt.ylabel('Sum of Passengers')
```

```
Out[92]: <matplotlib.text.Text at 0x1092ae908>
```



Average Ages for Deceased Passengers

Deceased males in passenger class 1 top the entire list as being the oldest with an average age of 44.58. Males in this class are also the oldest males out of all passenger classes.The average for deceased females in first class had an average age of 25.67, which comes in second for females out of all passenger classes. Deceased females in passenger second class had the highest average age for females with an age of 36. The average age for the youngest deceased males and females both come from third class.

```
In [93]: titanic_deceased.groupby(['Class','Sex'])['Age'].mean()
```

```
Out[93]: Class         Sex
         First Class   female    25.666667
                       male      44.581967
         Second Class  female    36.000000
                       male      33.369048
         Third Class   female    23.818182
                       male      27.255814
         Name: Age, dtype: float64
```

Fare

While skimming through the dataset, I noticed that there were passengers who didn't pay any fare (basically passengers who rode for free) on the titanic. I wanted to identify these passengers before I continued any analysis for fare.

A total of 15 passengers were on board the titanic without paying any fare. Some interesting facts about this set is that all passengers were male and had no family on board.

In [94]:

```
#Free_riders represents the passengers who didn't pay any fare.
free_riders = titanic_newset[titanic_newset["Fare"] == 0]
free_riders
```

Out[94]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Fare	Survival	Class
179	180	0	3	Leonard, Mr. Lionel	male	36.0	0	0	0.0	Died	Third Class
263	264	0	1	Harrison, Mr. William	male	40.0	0	0	0.0	Died	First Class
271	272	1	3	Tornquist, Mr. William Henry	male	25.0	0	0	0.0	Survived	Third Class
277	278	0	2	Parkes, Mr. Francis "Frank"	male	NaN	0	0	0.0	Died	Second Class
302	303	0	3	Johnson, Mr. William Cahoone Jr	male	19.0	0	0	0.0	Died	Third Class
413	414	0	2	Cunningham, Mr. Alfred Fleming	male	NaN	0	0	0.0	Died	Second Class
466	467	0	2	Campbell, Mr. William	male	NaN	0	0	0.0	Died	Second Class
481	482	0	2	Frost, Mr. Anthony Wood "Archie"	male	NaN	0	0	0.0	Died	Second Class
597	598	0	3	Johnson, Mr. Alfred	male	49.0	0	0	0.0	Died	Third Class
633	634	0	1	Parr, Mr. William Henry Marsh	male	NaN	0	0	0.0	Died	First Class
674	675	0	2	Watson, Mr. Ennis Hastings	male	NaN	0	0	0.0	Died	Second Class
732	733	0	2	Knight, Mr. Robert J	male	NaN	0	0	0.0	Died	Second Class
806	807	0	1	Andrews, Mr. Thomas Jr	male	39.0	0	0	0.0	Died	First Class
815	816	0	1	Fry, Mr. Richard	male	NaN	0	0	0.0	Died	First Class
822	823	0	1	Reuchlin, Jonkheer. John George	male	38.0	0	0	0.0	Died	First Class

Describing Fare Data

After excluding the passengers who didn't pay any fare, I decided to descibe the fare data by only analyzing those who paid, which has a count for 876 out of 891 passengers. According to the data, the average fare price was 32.7 dollars with a high standard deviation of 49.93. This tells us that the prices among fares are spread out greatly. The cheapest fare a passenger has paid is 4.02 while the highest being 512.33.

In [95]:

```
# The average fare of for each Pclass excluding those who didnt pay any Fare.
paid_riders = titanic_newset[titanic_newset["Fare"] > 0]
paid_riders[['Fare']].describe()
```

Out[95]:

	Fare
count	876.000000
mean	32.755650
std	49.936826
min	4.012500
25%	7.925000
50%	14.500000
75%	31.275000
max	512.329200

Average Fare based on Pclass

The average fare price for passengers based on passenger class shows something very interesting. The average fare in first class was very expensive compared to the other two with a fare of 86.14.

In [96]:

```
paid_riders.groupby(['Pclass'])['Fare'].mean()
```

Out[96]:

```
Pclass
1    86.148874
2    21.358661
3    13.787875
Name: Fare, dtype: float64
```

Not only do females in First class have high survival rates, but they also have the most expensive fare according to the data with 106.125. Males in first class also have high fare rates on average compared to the other two. Female fare averges are higher than men's fare averages in all classes. Males in third class have the lowest fare rates.

In [110]:

```
paid_riders.groupby(['Pclass','Sex'])['Fare'].mean()
```

Out[110]:

```
Pclass  Sex
1       female    106.125798
        male       70.099038
2       female     21.970121
        male       20.903064
3       female     16.118810
        male       12.809290
Name: Fare, dtype: float64
```

Who paid the highest fare?

A woman by the name of Anna Ward had the highest fare out of every passenger on the ship. She was 35 and had no family members on the titanic. She was also in first class. She also surivied, as there was always a high chance she would according to the data earlier which explains that females who were in the upper class had a 97% chance of survivng.

In [98]:

```
#Who paid the most fare to the titanic
#https://www.encyclopedia-titanica.org/titanic-survivor/annie-moore-ward.html
titanic_newset.loc[[paid_riders['Fare'].idxmax()]]
```

Out[98]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Fare	Survival	Class
258	259	1	1	Ward, Miss. Anna	female	35.0	0	0	512.3292	Survived	First Class

Who paid the lowest fare?

A man by the name of Tannous Bestros had the lowest fare out of every passenger on the ship. He was 20 and had no family members on the titanic. He was also in third class. Tannous did not survive. as there was always a very low chance he would survive according to the data earlier which explains that males who were in the lower class had a 13.5% chance of survivng.

In [99]:

```
#Who paid the lowest fare to the titanic
#https://www.encyclopedia-titanica.org/titanic-victim/tannous-betros.html
titanic_newset.loc[[paid_riders['Fare'].idxmin()]]
```

Out[99]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Fare	Survival	Class
378	379	0	3	Betros, Mr. Tannous	male	20.0	0	0	4.0125	Died	Third Class

Correlations

In [100]:

```
def correlation(x,y):
    std_x = ( x - x.mean()) / x.std(ddof=0)
    std_y = (y - y.mean()) / y.std(ddof=0)

    return(std_x * std_y).mean()
```

There's a considerable positive correlation between Fare and Survival. As Fare increases, survival tends to increase as well vice versa.

In [101]:

```
correlation(titanic_newset['Fare'],titanic_newset['Survived'])
```

Out[101]:

```
0.2573065223849616
```

There's a small positive correlation between Age and Fare. As age increases, the fare tends to increase as well vice versa.

In [102]:

```
correlation(titanic_newset['Fare'],titanic_newset['Age'])
```

Out[102]:

```
0.1022879397576524
```

There's a considerable negative correlation between Pclass and Survival. As Pclass increases, survival tends to decrease vice versa.

In [103]:

```
correlation(titanic_newset['Survived'],titanic_newset['Pclass'])
```

Out[103]:

```
-0.33848103596101325
```

There's a considerable negative correlation between Pclass and Age. As Pclass increases, Age tends to decrease vice versa.

```
In [104]: correlation(titanic_newset['Age'],titanic_newset['Pclass'])

Out[104]: -0.3701365794564008
```

There's a considerable negative correlation between Pclass and Fare. As Pclass increases, the fare tends to decrease vice versa.

```
In [105]: correlation(titanic_newset['Fare'],titanic_newset['Pclass'])

Out[105]: -0.5494996199439044
```

Conclusion

The main ideas of this report were to help analyze passenger data of those were on the titanic based on their passenger class, how their sex and age affected their survival, how much they paid for fare, and much more that was stated in the beginning of this project. The analysis in this report was substantial enough to ask questions. Some obvious limitations was the fact that I only had access to 891 passengers instead of 2224. The age data was something that I used frequently and it was also disheartening that age only accounted for 714 passengers, which was taken into consideration when anlyzing the titanic dataset..

Per the data, the majority of the passengers on the titanic were in third class with 491 , while second class, had the fewest amount of passengers with 184. First class had a total of 216 and most of that class survived while more than half passengers in third class died, which could mean that passengers in first class had more access to lifeboats. There were more males on the ship than females. An interesting note is the female total in third class. females in third class had the most out of every pclass group with 144.

For the most part women that were a priority for safety and survival, particularly within the first and second class. For females in third class, half of them survied while the other half died during the sinking of the Titanic. Many males, especially males in third class, perished while on the sinking ship when compared to the males that survived. Females in first and second class had a very high rate of survival, which means they were mostly likely to live during the sinking of titanic. Females in third class, like stated earlier, had a 50% chance of surival while on the titanic. Women were indeed a priority for ensuring saftey during the sinking of the titanic, but the data for men shows a differnt story. Males had less than a 50% survival rate for every passenger class. Even though males had a low survival rate all across the board, men in first class had a higher surival percentage of 36.9%. Males in second and third class had percentages of 15.7% and 13.5% respectively. If you were a male on the titanic in second and third class, your chances of survival were very slim.

Age accounted for 714 of the passengers. The average age of all passengers reported in the titanic datset is roughly 30 (29.6). The standard deviation of Age in this dataset is 14.53, which tells me that the data for the variable is spread out. The youngest person on the ship is .42 years old, a baby, while the oldest person is 80 years old. The majority of passengers on the Titanic were in their 20s while passenegers in their 30s and 40s come in second and third respectively. It is safe to say that the majority of passengers were in between

20 and 40 years old. According to the histogram there were quite a number of kids on board the titanic from ages 0-10.There were plenty of survivors who were in their 20s and 30s since the majority of passengers. It was interesting to see how manny children(ages 0-10) were on the titanic, ranging around 35 kids saved based on the data. =Living males in pclass 1 top the entire list as being the oldest with an average age of 36.24. Males in this class are also the oldest males out of all passenger classes. The average age for living females in pclass 1 also top the list with an average age of 34.93, higher than the averages ages in the other classes. Living males in pclass 2 had the youngest group out of all classes and sex with an average age of 16.02. The lowest average age for females comes from pclass 3 with an average age of 19.33.

Passengers in their 20s and 30s were the majority for deceased passengers. Deceased males in first class top the entire list as being the oldest with an average age of 44.58. Deceased males in this class are also the oldest males out of all passenger classes. The average for deceased females in first class had an average age of 25.67, which comes in second for females out of all passenger classes. Deceased females in pclass 2 had the highest average age for females with an age of 36. The average age for the youngest deceased males and females both come from third class.

A total of 15 passengers were on board the titanic without paying any fare. Some interesting facts about this set is that all passengers were male and had no family on board. The average fare price for passengers based on passenger class shows something very interesting. The average fare in pclass 1 was very expensive compared to the other two with a fare of 86.14. second and third class had average fares of 21.35 and 17.38 respectively. Not only do females in first class have high survival rates, but they also have the most expensive fare according to the data with 106.125. Males in first class also have high fare rates on average compared to the other two. Female fare averges are higher than men's fare averages in all classes. Males in third class have the lowest fare rates.

A woman by the name of Anna Ward had the highest fare out of every passenger on the ship. She was 35 and had no family members on the titanic. She was also in first class. She also surivied, as there was always a high chance she would according to the data earlier which explains that females who were in the upper class had a 97% chance of survivng. A man by the name of Tannous Bestros had the lowest fare out of every passenger on the ship. He was 20 and had no family members on the titanic. He was also in third class. Tannous did not survive. as there was always a very low chance he would survive according to the data earlier which explains that males who were in the lower class had a 13.5% chance of survivng.

Based on the data, those who have paid a higher fare tend to have high survival rates. Passengers who are placed in a higher passenger tend to have a lower survival rate. This works vice versa. Passengers who are older tend to have a lower passenger class, meaning that older passengers tend to be in first class. This works vice versa as well. Passengers who paid a higher fare also had a lower passenger class. This also works vice versa. I didn't face any drastic challenges, but I did come into contact with values that had missing data and values. Like stated earlier, this dataset's limitations revolved around not having all passenger information. Having the data from every passenger could have a massive effect on our findings.

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